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METHODS OF SAMPLING FOR AGRICULTURAL MACHINERY AND EQUIPMENT

PART 1 HAND-TOOLS AND HAND-OPERATED/ANIMAL-DRAWN EQUIPMENT

(First Revision)

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BUREAU OF INDIAN STANDARDS
MANAK BHAVAN, 9 BAHADUR SHAH ZAFAR MARG
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Indian Standard

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(*Continued on page* 2)

(*Continued from page* 1)

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0. FOREWORD

0.1 This Indian Standard (Part 1) (First Revision) was adopted by the Indian Standards Institution on 17 March 1987, after the draft finalized by the Sampling Methods for Food Products and Agricultural Inputs Sectional Committee had been approved by the Agricultural and Food Products Division Council.

0.2 The original version of this standard was published in 1974 and prescribed lot inspection plans for all types of agricultural machinery and tractors. With the considerable increase in the production of different types of agricultural machinery and equipment, the number of Indian Standards formulated in this field had also increased. It was felt that the original standard might not cater to the needs of all types of agricultural machinery and tractors, as the acceptable quality level desired, cost of equipment, cost and time of testing and number of items usually supplied in a lot, were quite different.

0.3 In this revised version, different types of agricultural machinery and equipment have been classified into two homogeneous groups. The first group covers hand-tools, such as sickles, hand-hoes, *KHURPIES* and budding knives, and the second group covers hand-operated and animal-drawn equipment, such as sprayers, ploughs, cultivators and drills.

0.4 Whereas Part 1 covers hand-tools and animal-drawn/hand-operated equipment, power-operated equipment will be covered in Part 2.

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1. SCOPE

1.1 This standard (Part 1) prescribes the scale of sampling and criteria of conformity for determining the acceptability or otherwise of hand-tools and animal-drawn/hand-operated agricultural machinery and equipment.

2. SCALE OF SAMPLING

2.1 Lot — In any consignment all the tools/equipments of the same type, same size and belonging to the same batch of manufacture, shall be grouped together to constitute a lot.

2.2 For ascertaining the conformity of the material in a lot to the requirements of the specification, samples shall be tested from each lot separately.

2.3 The number of tools/equipments to be tested from a lot shall depend on the size of the lot and shall be according to Table 1 or Table 2 as the case may be.

TABLE 1 SCALE OF SAMPLING AND PERMISSIBLE NUMBER OF DEFECTIVES FOR HAND-TOOLS

Number of Tools in the Lot	For Visual, Dimensional, Weight and Hardness Requirements		Sub-Sample Size for Other Requirements
	Sample Size	Permissible Number of Defectives	
(1)	(2)	(3)	(4)
Up to 100	5	0	1
101 to 300	8	0	2
301 to 500	13	1	3
501 to 1 000	20	2	4
1 001 and above	32	3	5

TABLE 2 SCALE OF SAMPLING AND PERMISSIBLE NUMBER OF DEFECTIVES FOR HAND-OPERATED ANIMAL-DRAWN EQUIPMENT

Number of Equipments in the Lot	For Visual, Dimensional, Weight and Hardness Requirements		Sub-Sample Size for Other Requirements
	Sample Size	Permissible Number of Defectives	
(1)	(2)	(3)	(4)
Up to 25	2	0	1
26 to 100	3	0	1
101 to 300	5	0	2
301 to 500	8	0	2
501 and above	13	1	3

2.3.1 These tools/equipments shall be selected at random from the lot and for this purpose, guidance can be obtained from IS : 4905-1968*. The procedures of simple random sampling or systematic sampling may be followed.

2.3.1.1 *Simple random sampling* — In case the lot consists of numbers of tools/equipments, such that each of these items is easily identifiable, the method of simple random sampling shall be followed for selecting the items for the sample. According to this method, the sample of requisite size n shall be drawn from a lot of size N in such a manner that while selecting the items, the chance for any item of the lot being included in the sample should be the same. An item once drawn should not be placed back in the lot. For this purpose, random number tables may be used.

Example:

It is desired to obtain a sample of 8 sickles from a lot of 200 sickles. If the sickles in the lot are mentally assigned serial numbers up to 200, the problem then becomes to obtain 8 random numbers in the range of 1 to 200. Taking the 3-digited random numbers from Appendix B of IS : 4905-1968* and starting with any number say 20, occurring in the 8th row and 11, 12 and 13 columns and proceeding downwards, numerals less than 200 are noted down. Thus the 8 numerals as obtained are 20, 53, 35, 149, 62, 174, 177 and 142. When arranged in ascending order of magnitude, the numerals become 20, 35, 53, 62, 142, 149, 174 and 177. The items in the lot corresponding to these numbers shall then be selected to constitute the required random sample of 8 sickles.

2.3.1.2 *Systematic sampling* — When the items in a lot are presented in an orderly manner, it should be possible to considerably simplify the selection of random sample of the required size. The method consists of first selecting a single sample item from a lot of N items and thereafter selecting items at regular pre-determined intervals to make up the desired sample of size n. For this purpose the integral part of N/n (say r) is taken as the interval and then the items are counted in one order and every rth item thus counted is withdrawn until the sample of required size is obtained.

Example:

Suppose 100 sprayers in a lot are stored in an orderly manner and a sample of 3 sprayers is to be selected at random. Calculate the integral part of 100/3 (= 33·3) which is 33. Starting from any sprayer (random number tables may be used), count the sprayers in

*Methods for random sampling.

one order as 1, 2, 3, ..., 33 and so on. Every 33rd sprayer so counted shall be chosen till 3 sprayers are obtained to constitute the desired sample. In this case, the sample sprayers to be selected are those corresponding to serial numbers 33, 66 and 99.

NOTE — This method of systematic sampling is quite simple and a good approximation to simple random sampling.

3. NUMBER OF TESTS AND CRITERIA FOR CONFORMITY

3.1 The hand-tools/equipments selected according to col 1 and 2 of Table 1 or Table 2 as the case may be, shall be examined for visual, dimensional weight and hardness requirements as given in the relevant material specification. Any tool equipment failing to satisfy one or more of these requirements shall be considered as defective. The lot shall be considered as conforming to these requirements if the number of defectives found in the sample is less than or equal to the corresponding permissible number of defectives given in col 3 of Table 1 or Table 2 as the case may be.

3.2 The lot having been found satisfactory according to **3.1**, shall be further tested for requirements other than those covered in **3.1**. For this purpose, the number of tools equipments given for sub-sample in col 4 of Table 1 or Table 2 as the case may be, shall be selected from the lot. These tools/equipments shall be selected from those already examined according to **3.1** and found satisfactory. The lot shall be declared as conforming to the requirements of the relevant material specification if none of the tools/equipments in the sub-sample fails in any of these requirements.

BUREAU OF INDIAN STANDARDS

Headquarters:

Manak Bhavan, 9 Bahadur Shah Zafar Marg, NEW DELHI 110002

Telephones: 331 01 31, 331 13 75 Telegrams: Manaksanstha (Common to all Offices)

Regional Offices:	*Telephone*
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